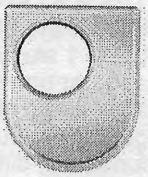
Code M208 | Level 2 | 60 points |

Pure mathematics



The Open University

Quick facts

No residential school

7 Tutor-marked assignments (TMAs)

Examination

Course content

Pure mathematics is one of the oldest creative human activities. It can be studied for its own sake, because of its intrinsic elegance and powerful ideas, but it also provides many of the principles that underlie applications of mathematics.

This course introduces the main topics of pure mathematics. It is suitable whether you want a basic understanding of mathematics without taking the subject further, or to prepare for higher-level courses in pure mathematics, or if you teach mathematics (it includes a good deal of background to the A-level mathematics syllabuses, for example).

You will become familiar with new mathematical ideas mainly by using pencil and paper and by thinking. You will need a scientific calculator but will not need it in the examination. You do not need a computer, though there are many opportunities to use one to reinforce your understanding of new topics if you so wish. In particular, there is guidance on possible uses of the software package Mathcad, which is supplied as part of our courses MST121 *Using mathematics* and MS221 *Exploring mathematics*.

Introduction *Real Functions and Graphs* is a reminder of the principles underlying the sketching of graphs of functions and other curves. *Mathematical Language* covers the writing of pure mathematics and some of the methods used to construct proofs. *Number Systems* looks at the systems of numbers most widely used in mathematics: the integers, rational numbers, real numbers, complex numbers and modular or 'clock' arithmetics.

Group Theory (A) *Symmetry* studies the symmetries of plane figures and solids, including the five 'Platonic solids', and leads to the definition of a group. *Groups and Subgroups* introduces the idea of a cyclic group, using a geometric viewpoint, as well as isomorphisms between groups. *Permutations* introduces permutations, the cycle decomposition of permutations, odd and even permutations, and the notion of conjugacy. *Cosets and Lagrange's Theorem* is about 'blocking' a group table, and leads to the notions of normal subgroup and quotient group.

Linear Algebra *Vectors and Conics* is an introduction to vectors and to the properties of conic sections. *Linear Equations and Matrices* explains why simultaneous equations may have different numbers of solutions, and also explains the use of matrices. *Vector Spaces* generalises the plane and three-dimensional space, providing a common structure for studying seemingly different problems. *Linear Transformations* is about mappings between vector spaces that preserve many geometric and algebraic properties. *Eigenvectors* leads to the diagonal representation of a linear transformation, and applications to conics and quadric surfaces.

Analysis (A) *Numbers* deals with real numbers as decimals, rational and irrational numbers, and goes on to show how to manipulate inequalities between real numbers. *Sequences* explains the 'null sequence' approach, used to make rigorous the idea of convergence of sequences, leading to the definitions of *pi* and *e*. *Series* covers the convergence of series of real numbers and the use of series to define the exponential function. *Continuity* describes the sequential definition of continuity, some key properties of continuous functions, and their applications.

Group Theory (B) *Conjugacy* looks at conjugate elements and conjugate subgroups, and returns to the idea of normal subgroups in this context. *Homomorphisms* is a generalisation of isomorphisms, which leads to a greater understanding of normal subgroups. *Group Actions* is a way of relating groups to geometry, which can be used to count the number of different ways a symmetric object can be coloured.

Analysis (B) *Limits* introduces the epsilon-delta approach to limits and continuity, and relates these to the sequential approach to limits of functions. *Differentiation* studies differentiable functions and gives l'Hôpital's rule for evaluating limits. *Integration* explains the fundamental theorem of calculus, the Maclaurin integral test and Stirling's formula. *Power Series* is about finding power series representations of functions, their properties and applications.

Entry

Created on 10.09.2008

This is a Level 2 course and you need a good knowledge of the subject area, obtained either from Level 1 study with the OU or from equivalent work at another university. You should have a good basic knowledge of elementary algebra, coordinate geometry, Euclidean geometry, trigonometry, functions, differentiation and integration. It would also be helpful to have met vectors, matrices and groups, though these are not essential. The ideal preparation would be good passes in MST121 *Using mathematics* and MS221 *Exploring mathematics*. Students are more likely to complete this course successfully if they have acquired their prerequisite knowledge through passing these courses. If you have any doubt about the suitability of the course, please contact our Student Registration & Enquiry Service. A diagnostic quiz that will enable you to determine whether you are adequately prepared for this course can be found on the website:
http://puremaths.open.ac.uk/m208quiz/M208DG.pdf

Preparatory work

If you need to revise the subjects described in *Entry*, or you want to do some preparatory work, try reading some current A-level textbooks, such as the *MEI Structured Mathematics* texts on Pure Mathematics and Further Pure Mathematics published by Hodder. They contain plenty of exercises to get you used to regular study. For an exciting and accessible introduction to pure mathematics, try *From Here to Infinity* by Ian Stewart (Oxford Paperbacks).

Qualifications

M208 is a compulsory course in our:

- B31 BA (Hons) or BSc (Hons) Mathematics
- D23 Diploma in Mathematics

It is a specified course in our:

- B36 BA (Hons) or BSc (Hons) Mathematics and Statistics
- B14 BA (Hons) or BSc (Hons) Computing and Mathematical Sciences
- B15 BA (Hons) or BSc (Hons) Economics and Mathematical Sciences
- B46 BSc (Hons) Mathematics and its Learning

It can also count towards most of our other degrees at bachelors level, where it is equally appropriate to a BA or BSc. We advise you to refer to the relevant award descriptions for information on the circumstances in which the course can count towards these qualifications because from time to time the structure and requirements of a qualification may change.

If you have a disability or additional requirements

Please be aware that the course contains a large number of diagrams. The course materials are available in Adobe Portable Document Format (PDF). Some Adobe PDF components may not be available or fully accessible using a screen reader and mathematical, scientific, and foreign language materials may be particularly difficult to read in this way. Written transcripts are available for the audio-visual material. The books are available in a comb-bound format.

If you are a new student, make sure that you have our booklet *Meeting your needs*. You can obtain a copy by contacting our Student Registration & Enquiry Service. We provide a range of support services for individual needs but some of these may take several months to arrange. Please contact us for advice if you have concerns about taking this course, or about the support that could be provided. The website www.open.ac.uk/disability has the latest information about availability.

Course materials

We use a mixture of media to help you learn. Our courses may include any of the following media that you will use from home (or wherever you choose to study): specially written texts, set books, online resources, audio CDs, audio and video cassettes, DVDs, CD-ROMs, computer software, a home experiment kit. For further information on set books go to http://www3.open.ac.uk/about/setbooks/index.shtm.

Teaching and assessment

Support from your tutor

You will have a tutor who will help you with the course material and mark and comment on your written work, and whom you can ask for advice and guidance. We may also be able to offer group tutorials or day schools that you are encouraged, but not obliged, to attend. Where your tutorials are held will depend on the distribution of students taking the course. Contact our Student Registration & Enquiry Service if you want to know more about study with the Open University before you register.

Assessment

There are seven tutor-marked assignments (TMAs), submitted on paper, and an examination. Assessment is an essential part of the teaching, so you are expected to complete it all, but if you unavoidably miss or do badly in an assignment, some courses allow you a 'substitution score', calculated as a weighted average of all your scores for the course. In M208 this rule can apply to one assignment only. You will be given more detailed information when you begin the course.

Professional recognition

This course may help you to gain recognition from a professional body. Ask our Student Registration & Enquiry Service for *Recognition* leaflets 3.3 *Professional Engineering Institutions*, 3.6 *Institute of*

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Mathematics and its Applications and 3.11 *Other Professional Bodies* or see the course description for **M208** at www.open.ac.uk/courses.

More information

For full details, including course fees, start dates, services for disabled students, any computing requirements and information on how to become a student, visit the Course and Qualifications website www.open.ac.uk/courses.

We make every effort to ensure that this information is accurate but it could change if regulations or policies change or because of financial or other constraints.

Created on 10.09.2008